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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/660,565

09/12/2003

Howard Rhodes

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EXAMINER

ARENA, ANDREW OWENS

ART UNIT

PAPER NUMBER

2811

MAIL DATE

DELIVERY MODE

04/30/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/660,565

Applicant(s)

RHODES ET AL.

Examiner

Andrew O. Arena

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 07 December 2006 and 24 January 2007.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 90 and 93-141 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 90,93-121 and 130-136 is/are allowed.
- 6) ☒ Claim(s) 122-129 and 137-141 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01/10/2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed (on 01/24/2007) in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/07/2006 has been entered.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### ***Drawings***

Fig 13 is objected to because it seems that reference character 126 is a misprint and should be changed to 125, since it seems to reference the photodiode (see Fig 12).

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance. See MPEP § 608.02(p).

### ***Claim Rejections - 35 USC § 103***

Claims 122-129 and 137-141 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rhodes (US 6,204,524) in view of Lauxtermann (US 2001/0015831).

**Re claim 122**, Rhodes discloses (Fig 6-14) a method of forming an imager (col 8 In 28-30) comprising the steps of:

providing a semiconductor substrate (116+120; col 8 In 30-32) having a doped layer (120) of a first conductivity type (col 8 In 32-33);

forming a field oxide region (115; col 7 In 25-28) in said semiconductor substrate;

forming a photosensor (Fig 5: 125, col 7 In 36-37; col 8 In 45 – col 9 In 25) including a charge collection region (110) of a second conductivity type (col 7 In 31-32), said charge collection region being provided in said doped layer (col 7 In 30-31), said charge collection region being adjacent one side (left) of a gate of a pixel transistor (128; col 7 In 37-38);

forming a floating diffusion region (130; col 7 In 41-43, col 9 In 8-17) for receiving charge (accumulated: col 7 In 46-48) from said charge collection region (by way of transfer transistor 128: col 7 In 37-38), said floating diffusion region being connected to said gate of said pixel transistor (128) and being adjacent another side (right) of said gate (of 128) opposite said charge collection region (110); and

forming a charge storage capacitor (162; col 9 In 36-37) over said semiconductor substrate (col 7 In 66-67) so that one electrode (156) of said storage capacitor is connected directly to a region (155) by an electrical contact (150; col 8 In 10-13).

Rhodes differs from the claimed invention only in not disclosing a charge storage capacitor connected directly to said floating diffusion region by an electrical contact.

Lauxtermann discloses (Fig 2B) an analogous CMOS imager (¶1) comprising: a photosensor (PD; ¶6 In 5) and a floating (no fixed potential) diffusion region (55; ¶7 In 6)

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for receiving charge from said photosensor (¶6 ln 7-11) adjacent opposite sides of a gate of a pixel transistor (M2; ¶8 ln 3); and one electrode of a charge storage capacitor (C1; ¶6 ln 10-11) is connected directly to said floating diffusion region by an electrical contact to allow separation of the detection and reading processes (¶6 ln 17-19).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Rhodes in view of Lauxtermann by forming a charge storage capacitor over said semiconductor substrate using the method taught by Rhodes so that one electrode of said storage capacitor is connected directly to said floating diffusion region by an electrical contact; at least to allow separation of the detection and reading processes.

**Re claim 123**, Rhodes as modified discloses the entire extent of said charge storage capacitor overlies said field oxide region (no portion of lies under 115).

**Re claim 124**, Rhodes as modified discloses the entire extent of said charge storage capacitor overlies an active area of said photosensor (no portion lies under 125).

**Re claim 125**, Rhodes as modified discloses said charge storage capacitor is formed (at least) partially over said field oxide region (no portion lies under 115) and (at least) partially over an active area of said photosensor (no portion lies under 125).

**Re claim 126**, Rhodes as modified discloses the other electrode of said charge storage capacitor is connected to ground (slash is Vss ground: Lauxtermann ¶8 ln 14).

**Re claim 127**, Rhodes as modified discloses the other electrode of said charge storage capacitor is connected to a gate of a transistor (there exists a connection pathway from the grounded electrode through the capacitor to a gate, e.g., of 136).

**Re claim 128**, Rhodes discloses (Fig 14) said transistor (ex, 128) is part of a three-transistor cell (e.g., 102, 128, 132).

**Re claim 129**, Rhodes discloses (Fig 5) said transistor (ex, 128) is part of a four-transistor cell (e.g., 102, 128, 132, 136).

**Re claim 137**, Rhodes discloses (Fig 6-14) a method of forming an imager (col 8 ln 28-30) comprising the steps of:

providing a semiconductor substrate (116+120; col 8 ln 30-32) having a doped layer (120) of a first conductivity type (col 8 ln 32-33);

forming a field oxide region (115; col 7 ln 25-28) in said semiconductor substrate;

forming a photosensor (Fig 5: 125, col 7 ln 36-37; col 8 ln 45 – col 9 ln 25) including a charge collection region (110) of a second conductivity type (col 7 ln 31-32), said charge collection region being provided in said doped layer (col 7 ln 30-31), said charge collection region being adjacent one side (left) of a gate of a pixel transistor (128; col 7 ln 37-38);

forming a floating diffusion region (130; col 7 ln 41-43, col 9 ln 8-17) for receiving charge (accumulated: col 7 ln 46-48) from said charge collection region (by way of transfer transistor 128: col 7 ln 37-38), said floating diffusion region being connected to said gate of said pixel transistor (128) and being adjacent another side (right) of said gate (of 128) opposite said charge collection region (110); and

connecting an electrode (156) of a {second} charge storage capacitor (Fig 5: 162; col 9 ln 36-37) to said charge collection region (110) by a {second} electrical contact (150; col 7 ln 61-64).

Rhodes differs from the claimed invention only in not disclosing "connecting an electrode of a first charge storage capacitor to said floating diffusion region."

Lauxtermann discloses (Fig 2B) an analogous CMOS imager (¶1) comprising: a photosensor (PD; ¶6 ln 5) and a floating (no fixed potential) diffusion region (55; ¶7 ln 6) for receiving charge from said photosensor (¶6 ln 7-11) adjacent opposite sides of a gate of a pixel transistor (M2; ¶8 ln 3); and one electrode of a charge storage capacitor (C1; ¶6 ln 10-11) is connected directly to said floating diffusion region by an electrical contact to allow separation of the detection and reading processes (¶6 ln 17-19).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Rhodes in view of Lauxtermann by forming a first charge storage capacitor over said semiconductor substrate using the method taught by Rhodes and then connecting an electrode of said first charge storage capacitor to said floating diffusion region by a first electrical contact; at least to allow separation of the detection and reading processes.

**Re claim 138**, Rhodes as modified discloses said first charge storage capacitor is formed such that the extent of said charge storage capacitor overlies said field oxide region (no portion lies under 115).

**Re claim 139**, Rhodes as modified discloses a first portion of said first charge storage capacitor is formed over said field oxide region (no portion lies under 115), and

a second portion of said first charge storage capacitor is formed over an active area of said photosensor (no portion lies under 125).

**Re claim 140**, Rhodes as modified discloses said second charge storage capacitor is formed such that the extent of said charge storage capacitor overlies said field oxide region (no portion lies under 115).

**Re claim 141**, Rhodes as modified discloses a first portion of said second charge storage capacitor is formed over said field oxide region (no portion lies under 115), and a second portion of said second charge storage capacitor is formed over an active area of said photosensor (no portion lies under 125).

### ***Response to Arguments***

The arguments filed 12/07/2006 with respect to claims 122-129 have been considered but are moot in view of the new ground of rejection.

The arguments filed 12/07/2006 with respect to claims 137-141 have been fully considered but they are not persuasive.

The arguments against the references individually ("Rhodes is silent about a first charge storage capacitor and a second charge storage capacitor"; "Lauxtermann relates to a method of maintaining constant the sampled charge stored in memory node..."; reply pg 15) cannot be the basis of showing nonobviousness since the rejections are based on combinations of references. See MPEP § 2145(IV).

Rhodes differs from the claimed invention only in not disclosing a capacitor connected to the claimed floating diffusion region. Lauxtermann discloses a device



nearly identical to that of Rhodes, including a capacitor connected to the claimed floating diffusion region; the prior art references as combined teach all claim limitations. See MPEP § 2143.03. A reasonable expectation of success is present since the devices are so similar. See MPEP § 2143.02. Lauxtermann suggests the desirability of the modification made. See MPEP § 2143.01.

Examiner has met all three basic requirements of a *prima facie* case of the obviousness of the rejected claims. See MPEP § 2143. Applicant has not provided persuasive evidence of nonobviousness. See MPEP §2142 (¶1).

As a formal note, the title submitted 08/16/2006 is not descriptive of the presently allowed claims, however, the title proposed in the action dated 07/07/2006 is. If the rejected claims are amended to be allowable for the same reasons as those presently allowed, the title should be amended accordingly.

#### ***Allowable Subject Matter***

Claims 90, 93-121 and 130-136 are allowed.

Allowable subject matter has been indicated because the references of record, alone or in combination, do not teach or suggest that "the entire extent of said charge storage capacitor [is] within said lateral boundaries of said field oxide region".

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**Conclusion**


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew O. Arena whose telephone number is 571-272-5976. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard T. Elms can be reached on 571- 272-1869. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Andrew O Arena  
25 April 2007



Sara Crane  
Primary Examiner